AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A Fourier transform processor for processing at least two communication channels, and the Fourier transform processor comprising:

a) an input sample delivery circuit ~~for delivering~~ configured to deliver ~~a sample set of a one of N_f time domain samples and N_f frequency domain samples in a row and column order~~ the at least two communication channels as a pipelined succession of two dimensional sample arrays each having dimensions corresponding with communication parameters of the associated one of the at least two communication channels; and

b) at least one row and column transform circuit ~~with an input and an output,~~ coupled to the input sample delivery circuit to effect a pipelined 2-dimensional Fourier transformation of each successive sample array there from and ~~the row and column circuit performing~~ a length of the pipelined 2-dimensional Fourier transformation dynamically reconfigured for each successive sample array ~~a row and column transform on complex valued samples at the input~~ to correspond with the dimensions thereof. ~~to produce at the output coefficients corresponding with an other of the time domain and the frequency domain; and~~

~~c) at least one sliced radix circuit of order "R" with R parallel inputs coupled to said input sample delivery circuit and an output coupled to the input of said at least one row and column circuit, and said at least one sliced radix circuit transforming N_f/R input samples from the sample set into a selected one among the R possible complex outputs and the deliveries of the sample set to said at least one sliced radix circuit corresponding in a number with the number of remaining ones among the R possible complex outputs.~~

2. (Currently Amended) The Fourier transform processor of Claim 1, wherein ~~said input sample delivery circuit further comprises:~~

~~a downstream communication circuit for processing downstream packets each including a respective frequency domain sample set of a portion of a channel of data destined for a subscriber;~~

~~an upstream communication circuit for processing upstream packets each including a respective time domain sample set of a portion of a channel of data from a subscriber; and~~

~~an input memory for consecutive delivery of each of said sample sets.~~

the input sample delivery circuit further delivers sample sets of both frequency domain sample arrays together with time domain sample arrays and the at least one row and column transform circuit further dynamically re-configures the pipelined 2-dimensional Fourier transformation between a frequency-to-time domain transform and a time-to-frequency domain transform depending on the domain of each successive sample array delivered.

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3. (Currently Amended) The Fourier transform processor of Claim ~~2~~ 1, wherein ~~said~~ the input sample delivery circuit and the at least one row and column transform circuit further ~~comprises~~ comprise:

~~logic for correlating the upstream packets and downstream~~ device packets encapsulating each sample array and each device packet ~~with a corresponding protocol together with a variable size N_f of each of the sample sets on the basis of a corresponding indicia within each of the upstream and downstream packets~~ identifying both the corresponding one of the at least two communication channels together with any processing instructions therefore ; and

~~logic for configuring each of said at least one row and column circuit together with said at least one sliced radix circuit responsive to the correlating of said logic for correlating.~~

components responsive to each device packet to vary the processing of the associated sample array based on the channel identification and processing instructions in each device packet.

4. (Currently Amended) The Fourier transform processor input sample delivery circuit of Claim ~~2~~ 1, ~~wherein the downstream packets and upstream packets collectively include more than one X-DSL communication protocol.~~ wherein the communication parameters include a number of tones of a corresponding multi-tone communication protocol and wherein further the number of tones exhibited by a first of the at least two communication channels differs from the number of tones exhibited by a second of the at least two communication channels.

5. (Currently Amended) The Fourier transform processor of Claim 1, wherein ~~said input sample delivery~~ the at least one row and column transform circuit further comprises:

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~~logic for folding the set of N_t samples into a first two-dimensional array of Y rows and X columns;~~

~~logic for decomposing each of the Y rows into a second two-dimensional array with R columns corresponding in a number with the order of the radix and Z rows, and with each of the Z rows comprising one of the selected subsets and with each sample within each of the Z rows corresponding with an interleaving of a corresponding one of the Y rows at a sample separation substantially equal to X/R.~~

a sliced radix module of order "R" with R parallel inputs coupled to the input sample delivery circuit and the sliced radix module generating 1/R of the Fourier transforms of each row of each two dimensional sample array on each of R passes through the rows and each of the 1/R Fourier transforms selected to provide a solution of coefficients required to process successive selected ones of the columns of each two dimensional sample array;

a row module coupled to the sliced radix module to complete each row transform from the sliced radix module; and

a column module coupled to the row module to complete the Fourier transformation of each successive selected one of the columns of each two dimensional sample array during each of the R passes of the sliced radix module, thereby improving throughput by overlapping row and column processing of each two dimensional sample array.

6. (Currently Amended) The Fourier transform processor of Claim ~~1~~ 5, wherein ~~said input sample delivery circuit further comprises:~~ the row and column modules each include:

~~logic for determining that a sample set of N_i samples includes exclusively real valued time domain samples; and~~

~~logic for compressing the sample set to N_f samples by expressing corresponding pairs of real values samples as a single complex valued sample, wherein N_f substantially equals half of N_i.~~

at least one variable order radix sub-module responsive to the input of each sample array to vary an order of the radix based on the dimensions of the sample array.

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7. (Currently Amended) ~~The~~ A Fourier transform processor ~~of Claim 1, wherein said input sample delivery circuit further comprises~~ comprising:

a) an input sample delivery circuit for delivering a sample set of a one of N_f time domain samples and N_f frequency domain samples in a row and column order, and the input sample delivery circuit including;

logic for determining that the sample set includes frequency domain samples which exhibit hermetian symmetry; and

logic for limiting the sample set to include only N_f samples by excluding any mirror reversed conjugates there from~~.~~ ;

b) at least one row and column circuit with an input and an output, and the row and column circuit performing a row and column transform on complex valued samples at the

input to produce at the output coefficients corresponding with an other of the time domain and the frequency domain; and

c) at least one sliced radix circuit of order "R" with R parallel inputs coupled to said input sample delivery circuit and an output coupled to the input of said at least one row and column circuit, and said at least one sliced radix circuit transforming N_f/R input samples from the sample set into a selected one among the R possible complex outputs and the deliveries of the sample set to said at least one sliced radix circuit corresponding in a number with the number of remaining ones among the R possible complex outputs.

8. (Currently Amended) The Fourier transform processor of Claim ~~5~~ 1 , wherein ~~said at least one row and column circuit includes~~ the input sample delivery circuit further comprises :

~~a first row and column circuit coupled to the output of said first sliced radix; and~~

~~a second row and column circuit coupled to the output of said second sliced radix.~~

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logic for reducing the dimensions of sample arrays which exhibit hermetian symmetry by excluding any mirror reversed conjugates there from.

9. (Currently Amended) The Fourier transform processor of Claim 1, wherein ~~said~~ the at least one row and column transform circuit further comprises: ~~performs a row transform of an order X and a column transform of an order X + R.~~

a number "N" sliced radix modules each of order "R" with R parallel inputs coupled to the input sample delivery circuit and the N sliced radix modules each generating 1/R of the transforms on each row on each of R/N passes through the rows of each sample array and each of the 1/R row transforms selected to provide a solution of the coefficients to successive selected ones of the columns;

row modules each coupled to a corresponding one of the sliced radix modules to complete each row transform from the corresponding one of the sliced radix modules; and

column modules each coupled to a corresponding one of the row modules and each completing a transformation of each successive selected column during each of the R/N passes of the corresponding one of the sliced radix modules, thereby improving throughput of the at least one row and column transform circuit by overlapping row and column processing.

10. (Currently Amended) The Fourier transform processor of Claim ~~1~~ 9, wherein ~~said at least one sliced radix circuit includes~~ each of the row and column modules each include:

~~a first sliced radix circuit of the order R with R parallel inputs coupled to said input sample delivery circuit and an output, and said first sliced radix circuit transforming N_t/R input samples from the sample set into a first selected one among the R possible complex outputs; and~~

~~a second sliced radix circuit of the order R with R parallel inputs coupled to said input sample delivery circuit and an output, and said second sliced radix circuit transforming N_t/R input samples from the sample set into a second selected one among the R possible complex outputs.~~

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at least one variable order radix sub-module responsive to the dimensions of each successive sample array to vary an order of the radix correspondingly.

11. (Canceled)

12. (Currently Amended) A method for computing ~~a two dimensional~~ Fourier transforms of at least two communication channels, and the method comprising ~~the acts of~~:

~~selecting a sample set of N_t samples corresponding with a one of a frequency domain and a time domain;~~

delivering the at least two communication channels as a pipelined succession of two dimensional sample arrays each having dimensions corresponding with communication parameters of the associated one of the at least two communication channels; and

~~generating sliced radix transforms of an order R for each of N_f/ R selected subsets of the sample set, with each subset including R samples and with a slice corresponding with a radix R transformation of the R inputs from each of the selected subsets to a selected one among R complex outputs;~~

~~completing row and column transforms on the complex outputs generated in said act of generating; and~~

~~repeating the generating and completing acts for each of a remaining ones of the R complex outputs, to transform the N_f samples of the sample set to the other of the frequency domain and the time domain.~~

dynamically re-configuring a length of a pipelined 2-dimensional Fourier transformation of each successive sample array delivered in the delivering act to correspond with the dimensions of each successive sample array.

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13. (Currently Amended) The method of Claim 12, wherein the ~~selecting~~ dynamically re-configuring act further comprises ~~the acts of~~:

accepting ~~upstream packets each including time domain samples and downstream packets each including frequency domain samples and each of the upstream and downstream packets corresponding with selected ones of a plurality of upstream channels of data and downstream channels of data respectively~~ pipelined input of both frequency domain sample arrays together with time domain sample arrays; and

~~correlating each of the upstream packets and downstream packets with a corresponding protocol together with a size N_f of the sample set on the basis of a corresponding indicia within each of the upstream and downstream packets.~~ dynamically re-configuring the pipelined 2-dimensional Fourier transformation of each sample array between

a time-to-frequency domain transform and a frequency-to-time domain transform depending on the domain of each successive sample array delivered.

14. (Currently Amended) The method of Claim 13, wherein the ~~corresponding protocols correlated in said correlating act include X-DSL protocols.~~ delivering act communication parameters include a number of tones of a corresponding multi-tone communication protocol and wherein further the number of tones exhibited by a first of the at least two communication channels differs from the number of tones exhibited by a second of the at least two communication channels.

15. (Currently Amended) The method of Claim 12, wherein the ~~selecting act further comprises~~ delivering and dynamically varying acts further comprise :

~~successively selecting sample sets of both varying sample sizes N_f and domain characteristics.~~ encapsulating each sample array in a device packet identifying both the corresponding one of the at least two communication channels together with any processing instructions therefore; and

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varying the processing of each sample array based on the channel identification and processing instructions in each device packet.

16. (Currently Amended) The method of Claim 12, wherein the ~~selecting~~ delivering act further comprises ~~the acts of~~:

~~determining that a sample set of N_i samples includes exclusively real valued time domain samples; and~~

~~compressing the sample set to N_f samples by expressing corresponding pairs of real values samples as a single complex valued sample, wherein N_f substantially equals half of N_i.~~

reducing the dimensions of sample arrays which exhibit Hermetian symmetry by excluding any mirror reversed conjugates there from.

17. (Currently Amended) ~~The~~ A method of ~~Claim 12, wherein the selecting act further comprises the acts~~ of computing a two dimensional Fourier transform, and the method comprising the acts of:

selecting a sample set of N_f samples corresponding with a one of a frequency domain and a time domain;

determining that the sample set includes frequency domain samples which exhibit hermetian symmetry; and

limiting the sample set to include only N_f samples by excluding any mirror reversed conjugates there from.

generating sliced radix transforms of an order R for each of N_f/ R selected subsets of the sample set, with each subset including R samples and with a slice corresponding with a radix R transformation of the R inputs from each of the selected subsets to a selected one among R complex outputs;

completing row and column transforms on the complex outputs generated in said act of generating; and

repeating the generating and completing acts for each of a remaining ones of the R complex outputs, to transform the N_f samples of the sample set to the other of the frequency domain and the time domain.

18. (Currently Amended) The method of Claim 12, wherein the ~~selecting~~ dynamically varying act further comprises ~~the acts of~~:

~~folding the set of N_f samples into a first two-dimensional array of Y rows and X columns;~~

~~decomposing each of the Y rows into a second two dimensional array with R columns corresponding in a number with the order of the radix and Z rows, and with each of the Z rows comprising one of the selected subsets and with each sample within each of the Z rows corresponding with an interleaving of a corresponding one of the Y rows at a sample separation substantially equal to X/ R.~~

generating 1/R of the radix order "R" Fourier transforms on each row of each two dimensional sample array on each of R passes through the rows and each of the 1/R Fourier transforms selected to provide a solution of coefficients required to process successive selected ones of the columns of each two dimensional array;

completing each row transform generated in the generating act; and

effecting a transformation of each successive selected ones of the columns during each of the R passes in the generating act, thereby improving throughput by overlapping row and column processing of each two dimensional sample array.

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19. (Currently Amended) The method of Claim ~~12~~ 18, wherein ~~said generating act~~ the completing and effecting acts further comprises ~~the acts of~~:

~~selecting from a set of R_t^2 scale factors associated with a radix R transform a selected subset with R_t scale factors;~~

~~multiplying each of the R samples within the N_t / R subsets by a corresponding one of R scale factors within the selected subset;~~

~~summing products of each of the multiplications in said act of multiplying; and~~

~~multiplying resultants of said summing act by a corresponding twiddle factor to produce the selected one among the R complex outputs.~~ varying an order of a radix transform of each successive sample array based on the dimensions of the sample array.

20-21. (Canceled)